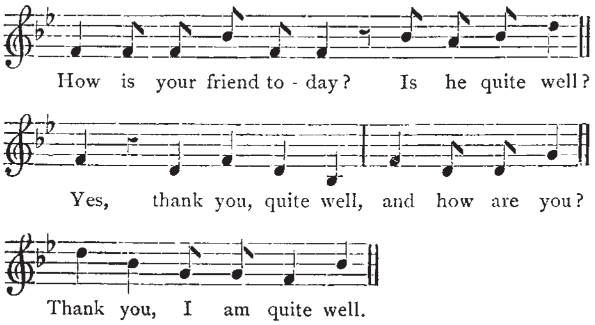
may call the reverse method. Take the following example given by Mr. Weber :—


How is your friend to - day? Is he quite well?
Yes, thank you, quite well, and how are you?
Thank you, I am quite well.

Now, let anyone execute this as written ; and then ask the bystanders whether it represents the manner in which the sentences would be expressed in talking. I think they would say, "That is not *talking ;* it is *singing ;*—it is opera recitative." And so on for all the examples. Mr. Weber seems to ignore the essential difference between the two ; *i.e.* the absence, in speaking, of the requisites to constitute elementary music. In the first place, in natural speaking there are no musical sounds, properly so called, inasmuch as it is scarcely possible for a hearer to catch notes of fixed and definite pitch ; the voice tends constantly to wander about in a vague and indefinite way ; the vocal cords, under the natural prompting, have no tendency to remain at a permanent degree of tension ; to keep them so there must be an intentional artificial effort ; and hence the occurrence, in speaking, of a monotone long sustained is unusual, and has a distinct musical character.

But if we could occasionally trace, in speaking, sounds of definite pitch, we should find the other requisite—namely, definite relations between them—wholly wanting. The idea that a person, when he speaks naturally (be he musician or no musician), has our scales in his mind, and makes his voice conform to them, is altogether untenable. The moment this is done it ceases to be natural speaking, and becomes designed musical performance.

Here, therefore, we find a most positive and unmistakable distinction between natural speech and music. The person using his voice must, for the latter purpose, do two things which require predetermination and effort ; and which are therefore essentially artificial and not naturally prompted : he must execute tones of well-defined pitch, and he must give them certain definite pitch relations with each other.

Mr. Weber has, in this matter, unintentionally approached very nearly a matter much debated among philosophers, namely, the Origin of Music. Mr. Herbert Spencer, some years ago, propounded a theory that music had taken its rise from the inflections of the voice in ordinary language. This has been strongly controverted ; but Mr. Weber goes further, and asserts that ordinary language is actually *music ready made !*

He has given, as a part of his illustrations, some interesting examples of street cries. These have no doubt a really musical character ; but it is odd that he did not see the distinction between them and ordinary talking—namely, that such cries and calls are *purposely sung*, and not spoken in the natural way. Of course, conforming to this condition, they can be correctly written down, and reasoned upon as specimens of true musical melody.

There is a useful moral to be drawn from all this; namely, a regret at the discouragement which is given to the study of the theory of music in a scientific point of view. Grove's Dictionary declares this to be useless to practical musicians, and so it is as long as they confine themselves to practice ; but when they meddle with theory the want of it must instantly make itself known. It is no disrespect to Mr. Weber to say that his article shows the loose way in which such matters are too often regarded. No one who has taken the very first steps in the philosophical study of the structure of music could entertain the idea that the sounds naturally emitted by birds, cows, or dogs, formed by the howling of the wind, or used in conversation, were entitled to be called either "music" or "melody." WILLIAM POLE.

THE BRITISH MUSEUM (NATURAL HISTORY BRANCH).

AMONGST the many new and interesting features connected with the British Museum (Natural History), Cromwell Road, has been the opening of a new gallery to the public, containing the Historical and Type Collections in the Department of Geology and Palæontology, under the care of Dr. Henry Woodward, F.R.S., who has favoured us with the following account of the same.

Taking the exhibition cases in *chronological order*, the earliest is the "Sloane Collection." This is the most ancient portion of the Geological Collection, having formed a part of the Museum of Sir Hans Sloane, Bart., F.R.S., acquired by purchase for the nation in 1753.

The geological specimens are stated to have consisted "in what by way of distinction are called *extraneous fossils*, comprehending petrified bodies, as trees or parts of them ; herbaceous plants ; animal substances," &c., and reported to be "the most extensive and most curious that ever was seen of its kind." Until 1857 the fossils and minerals formed one collection, so that a large part of the Sloane Collection consisted probably of mineral bodies and *not organic*, but in any case only about 100 specimens of invertebrate fossils can now be identified with certainty as forming part of the original Sloane Museum. Each specimen in the Sloane Collection had originally a number attached to it, corresponding to a carefully prepared Manuscript Catalogue, still preserved, which contains many curious entries concerning the various objects in the Museum. In the course of more than 130 years, many of these numbers have been detached from the objects or obliterated in cleaning. But as all fossils at this early date were looked upon *merely as curiosities*, but little attention was paid to the formation or locality whence they were derived. Historically, the collection has immense interest to us, marking the rapid strides which the science of geology has made of late years, especially as regards its more careful and systematic methods of study.

The next collection in chronological order is the "Brander Collection," and is the earliest one in which types of named and described species have been preserved.

This collection was formed by Gustavus Brander, F.R.S., in the earlier half of the last century, and an account of the same, with eight quarto plates, was published in 1766, entitled, "Fossilia Hantoniensia Collecta, et in Musæo Britannico deposita." The descriptions of the species given in the work were written by Dr. Solander, one of the Officers of the British Museum. They were "collected in the County of Hampshire, out of the cliffs by the sea-coast between Christchurch and Lymington, but more especially about the cliffs by the village of Hordwell, nearly midway betwixt the two former places" (*op. cit.* p. 111).

Only a small number out of the original 120 figured specimens are now capable of being identified, the rest having become, in the course of 120 years, commingled with the far more numerous and later Eocene Tertiary acquisitions, and so have lost their connexion with this admirable memoir. The engravings of the shells are equal to any modern published work descriptive of the fossils of the Eocene formation; but the names given by Dr. Solander are in many instances incorrect, according to our present knowledge of the genera of Mollusca.

The next series to which attention may be directed is the collection of Dr. William Smith. This collection, which was commenced about the year 1787, was purchased by the Trustees in 1816, a supplemental collection being added by Dr. Smith in 1818.

It is remarkable as the first attempt made to identify the various strata forming the solid crust of England and Wales by means of their fossil remains. There had been other and earlier collections of fossils, but to William Smith is due the credit of being the first to show that each bed of chalk or sandstone, limestone or clay, is marked by its own special organisms, and that these can be relied upon as characteristic of such stratum, wherever it is met with, over very wide areas of country.

The fossils contained in this cabinet were gathered together by William Smith in his journeys over all parts of England during thirty years, whilst occupied in his business as a land surveyor and engineer, and were used to illustrate his works, "Strata Identified by Organized Fossils," with coloured plates, quarto (1816; four parts only published): and his "Stratigraphical System of Organized Fossils" (quarto, 1817).

A coloured copy of his large geological map, the first geological map of England and Wales, with a part of Scotland, commenced in 1812 and published in 1815—size 8 feet 9 inches by 6 feet 2 inches wide, engraved by John Cary—is exhibited in the last wall-case on the right-hand side of this gallery, at the north end. It is well worthy of careful inspection.

William Smith was born at Churchill, a village of Oxfordshire, in 1769; he was the son of a small farmer and mechanic of the same name, but his father died when he was only eight years old, leaving him to the care of his uncle, who acted as his guardian. William's uncle did not approve of the boy's habit of collecting stones ("pundibs" = *Terebratulæ*, and "quoit-stones" = *Clypeus sinuatus*); but seeing that his nephew was studious, he gave him a little money to buy books. By means of these he taught himself the rudiments of geometry and land-surveying, and at the age of eighteen he obtained employment as a land surveyor in Oxfordshire, Gloucestershire, and other parts, and had already begun carefully and systematically to collect fossils and to observe the structure of the rocks. In 1793 he was appointed to survey the course of the intended Somersetshire Coal-Canal, near Bath. For six years he was the resident engineer of the canal, and, applying his previously-acquired knowledge, he was enabled to prove that the strata from the new red marl (Trias) upwards followed each other in a regular and orderly succession, each bed being marked by its own characteristic fossils, and having a general tendency or "dip" to the south-east.

To verify his theory he travelled in subsequent years over the greater part of England and Wales, and made careful observations of the geological succession of the rocks, proving also, by the fossils obtained, the identity of the strata over very wide areas along their outcrops.

His knowledge of fossils advanced even further, for he discovered that those *in situ* retained their sharpness, whereas the same specimens derived from the drifts or gravel-deposits were usually rounded and water-worn, and had reached their present site by subsequent erosion of the parent-rock.

In 1799, William Smith circulated in MS. the order of succession of the strata and embedded organic remains found in the vicinity of Bath. His large geological map of England and Wales is dated 1815. On June 1, 1816, he published his "Strata Identified by Organized Fossils," with illustrations of the most characteristic specimens in each stratum (4to). In 1817 he printed "A Stratigraphical System of Organized Fossils," compiled from the original geological collection deposited in the British Museum (4to). In 1819, he published a reduction of his great geological map, together with several sections across England. These have just been presented to the Museum by Mr. Wm. Topley.

Mr. Smith received the award of the *first* Wollaston Medal and fund in 1831, from the hands of Prof. Sedgwick, the President of the Geological Society, "as a great original discoverer in English geology, and especially for his having been the first, in this country, to discover and teach the identification of strata, and to determine their succession by means of their embedded fossils."

In June 1832, the Government of H.M. King William the Fourth awarded Mr. Smith a pension of £100 a year, but he only enjoyed it for seven years, as he died August 28, 1839. In 1835, the degree of LL.D. was conferred upon Mr. Smith by the Provost and Fellows of Trinity College, Dublin. The highest compliment paid him was that by Sedgwick, who rightly named him "the Father of English Geology."

The bust above the case which contains William Smith's collection is a copy of that by Chantry surmounting the tablet to his memory in the beautiful antique church of All Saints at Northampton, where his remains lie buried.

We come next to a collection, the very name of which betrays the antiquity of its origin. It is known as "Sowerby's Mineral Conchology."

This collection was begun by Mr. James Sowerby, prior to 1812, and continued by his son, Mr. James de Carle Sowerby, during the preparation of their great work entitled, "The Mineral Conchology of Great Britain," which appeared in parts, between June 1812 and December 1845, and forms six volumes octavo, illustrated with 648 plates.

The value of the work consists in the fidelity and accuracy of the figures given, and also in the fact that most of the specimens drawn are here named and described for the first time. They comprise fossils from all parts of England and from every geological formation. The small green labels mark the specimens actually figured in the work. The collection was purchased by the Trustees from Mr. J. de Carle Sowerby, January 1861. It may be interesting to record that many of the later parts were illustrated by plates drawn by the late Mr. J. W. Salter, for so many years palæontologist to the Geological Survey. When a youth, Salter was apprenticed to Mr. J. de Carle Sowerby, who was at that time both a naturalist and an engraver. The youthful apprentice afterwards married his master's daughter, and became, as is well known, one of the most brilliant palæontologists in this country.

Another curious but small series represents the "types" or "figured specimens" of "König's *Icones Fossilium Sectiles*."

This illustrated work, on miscellaneous fossils in the British Museum, was prepared by Mr. Charles König, the first Keeper of the Mineralogical and Geological Department, after its separation from the general Natural History Collections in 1825.

The engravings are rough, but characteristic, and the first "century" (or 100 figures of fossils), is accompanied by descriptions; the plates of the second "century" have names only, but no descriptions are published with them.

A far more important collection is that known as "The Gilbertson Collection."

In 1836, Prof. John Phillips published Vol. II. of his "Illustrations of the Geology of Yorkshire," which is devoted to the "Mountain Limestone District." In the introduction he writes as follows :—"My greatest obligation is to Mr. William Gilbertson, of Preston, a naturalist of high acquirements, who has for many years explored with exceeding diligence a region of mountain limestone, remarkably rich in organic remains. The collection which he has amassed from the small district of Bolland is at this moment unrivalled, and he has done for me, without solicitation, what is seldom granted to the most urgent entreaty; he has sent me for deliberate examination, at convenient intervals, THE WHOLE OF HIS MAGNIFICENT COLLECTION, accompanied by remarks dictated by long experience and a sound judgment." He (Gilbertson) had proposed to publish on the *Crinoidea* himself, but his sketches, as well as his specimens, were all placed at Prof. Phillips's disposal. Phillips adds: "An attentive examination of this rich collection rendered it unnecessary to study minutely the less extensive series preserved in other cabinets; . . . . *most of the figures of fossils are taken from specimens* in Mr. Gilbertson's collection, because these were generally the best that could be found."

The Gilbertson Collection was purchased for the British Museum in 1841.

The collections which follow mark a distinct era in the annals of geological science. Some forty-seven years ago a little Society was founded by a few London geologists—namely, Dr. J. Scott Bowerbank, F.R.S., Searles V. Wood, Prof. John Morris, Alfred White, Nathaniel T. Wetherell, James de Carle Sowerby, and Frederick E. Edwards—for the purpose of illustrating the Eocene Mollusca, and entitled the "London-Clay Club." They met at stated periods at each other's houses, and after a time they said, "Why should we not illustrate all the fossils of the British Islands, and from every formation?" No sooner proposed than a Society was founded, called the "Palæontographical Society," in the year 1847 (just forty years ago). The first volume, issued in that year, was "The Crag Mollusca, Part I., Univalves," by Mr. Searles V. Wood (with twenty-one plates).

The "Searles Wood Crag Collection" was commenced in 1826, and occupied about thirty years in its formation. It represents the Molluscan fauna of the Red and Coralline Crags of the neighbourhood of Woodbridge, and from Aldborough, Chillesford, Sudbourne, Oxford, Butley, Sutton, Ramsholt, Felixstowe, and many other localities in Suffolk, also from Walton-on-the-Naze in Essex. The specimens so collected were employed by Mr. Searles Wood in the preparation of his Monograph on the Crag Mollusca, published by the Palæontographical Society (1848-61); with supplements in 1871, 1873, and 1879, illustrated by seventy-one quarto plates. Each figured specimen is indicated by having a small green label affixed to it.

A geological description of the Crag formation by Mr. S. V. Wood, Jun., and Mr. F. W. Harmer, was issued by the Palæontographical Society in 1871 and 1873.

The collection was presented by Mr. S. V. Wood to the British Museum, January 1856, and a supplementary collection was given by Mrs. Searles V. Wood in 1885.

The next "Palæontographical Collection" is of nearly equal antiquity and fully of equal merit. It is the Eocene Molluscan Collection formed by the late Mr. Frederick E. Edwards, about the year 1835, and was continually being added to, until a few years before his death, which happened in 1875. It was acquired for the nation by purchase in 1873.

Originally intending to illustrate the fossils of the London Clay, Mr. Edwards extended his researches over the Eocene strata of Sussex, Hampshire, and the Isle of Wight, where, assisted by Mr. Henry Keeping, he made the most complete collection ever attempted by any geologist, and it still remains unrivalled.

Mr. Edwards contributed six memoirs to the Palæontographical Society, 1848-56, also separate papers to the *London Geological Magazine*, 1846, the *Geologist*, 1860, and the *Geological Magazine*, 1865, descriptive of the Eocene Mollusca, in his collection.

Mr. S. V. Wood continued the work for Mr. Edwards, describing and figuring the "Eocene Bivalves" in the annual volumes of the Palæontographical Society for 1859, 1862, 1870, and 1877. Each specimen which has been figured is specially marked.

About 500 species have been described and figured, but the collection is very rich in new and undescribed forms.

The last collection is that of a naturalist who devoted his entire life to the study and illustration of a single class of organisms, namely the Brachiopoda. It was formed by the late Dr. Thomas Davidson, F.R.S. (of 9 Salisbury Road, West Brighton, and Muir House, Midlothian), between the years 1837 and 1886, with the object of illustrating his great work on the "British Fossil Brachiopoda," published by the Palæontographical Society, in six large quarto volumes between the years 1850 and 1886, comprising 2290 pages of text, and 234 plates, with 9329 figures, and descriptions of 969 species.

Dr. Davidson was also the author of the Report on the recent Brachiopoda collected by H.M.S. *Challenger* (vol. i. 1880); of the article "Brachiopoda," in the "Encyclopædia Britannica," ninth edition, 1875; of a Monograph of "Recent Brachiopoda" (Trans. Linnean Society, 1886 and 1887), and of more than fifty other separate memoirs mostly bearing upon Brachiopoda both recent and fossil, printed in the Transactions and Journals of the various learned Societies, &c.

His collection, both of Recent and Fossil Brachiopoda, together with all Dr. Davidson's original drawings, his numerous books and pamphlets, were presented by him to the British Museum through his son Mr. William Davidson, February 1886. By his direction the entire collection of recent and fossil species are to be kept together in one series, for the convenience of reference of all men of science who may wish to consult the same.

NOTES.

ON Tuesday the Technical Instruction Bill was read a second time. The second reading having been moved by Sir W. Hart Dyke, Mr. S. Leighton proposed an amendment which would have led to the rejection of the measure, on the ground that a new change ought not at present to be imposed on ratepayers. The amendment was negatived; but in dealing with it Mr. Goschen and Mr. W. H. Smith found it necessary, as Mr. Mundella complained, to adopt a very "apologetic" and "persuasive" tone. The fact seems to indicate that a good many members of the House of Commons do not even yet realize that an adequate system of technical instruction is absolutely necessary to enable this country to hold its own in the industrial and commercial warfare of the present age.

IN a memorandum on the Scotch Technical Schools Bill, which has been introduced by the Lord Advocate, it is stated that, "as there is a School Board in every parish and burgh in Scotland, it is unnecessary to extend the powers of the Bill to any other local authority." The Bill is not to take effect in any parish or burgh until after the triennial election of a new School Board next year; and the resolution of a Board to establish a technical school requires confirmation at a second meeting of the Board, and also by the Scotch Education Department. While the subjects to be taught in the technical schools will be determined by the Department of Science and Art, the schools will in other respects be under the Scotch Education Department. No scholar will be admitted into a technical school until he has passed the fifth standard, which in Scotland frees from the obligation to attend an elementary school. The proposal that adults above the age of twenty-one shall not be